Jan. 2, 1923.

1,440,587

C. G. FEUCHT.

SAFETY DEVICE FOR ROLLER COASTERS.

FILED MAY 26, 1922.

2 SHEETS-SHEET 1

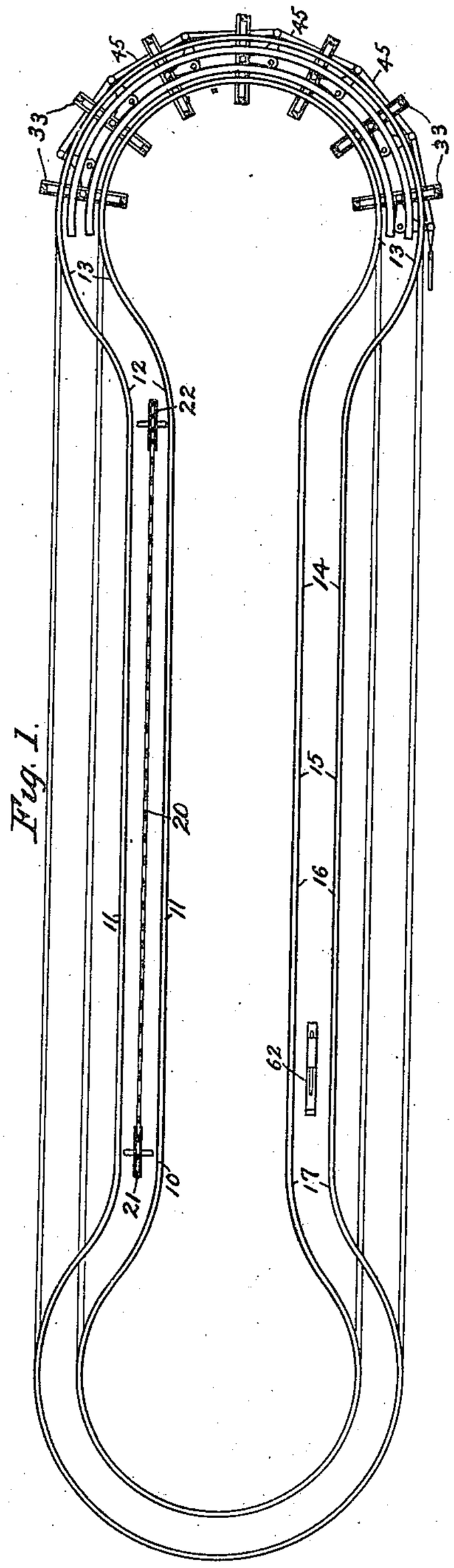

Fig. 1.

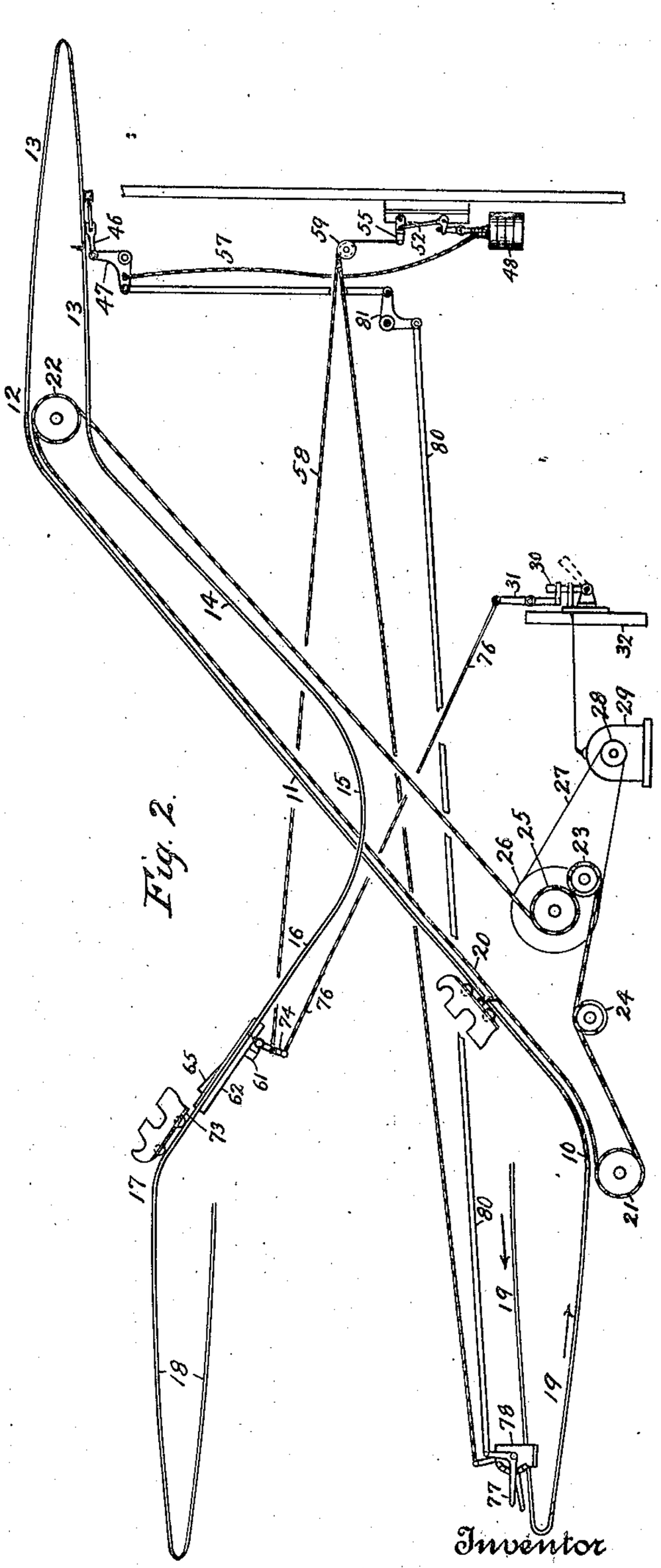

Fig. 2.

Inventor

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By his Attorney

Wm Bodge

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2 SHEETS-SHEET 2

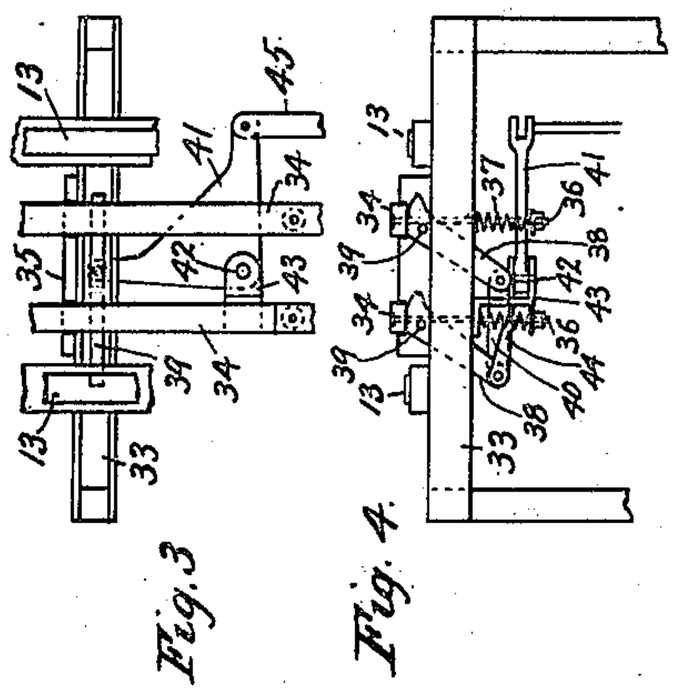

Fig. 3.

Fig. 4.

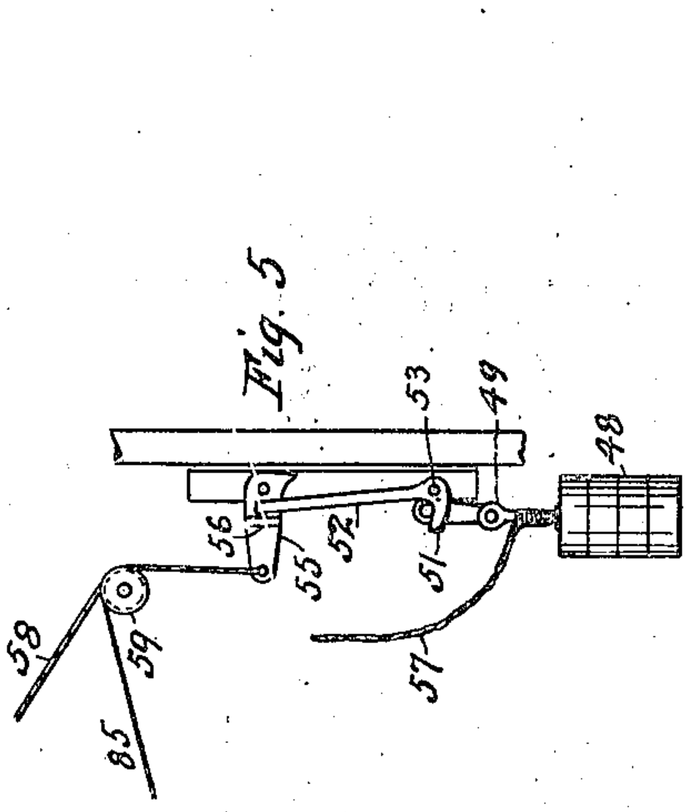

Fig. 5

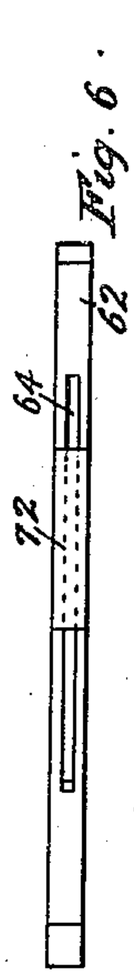

Fig. 6.

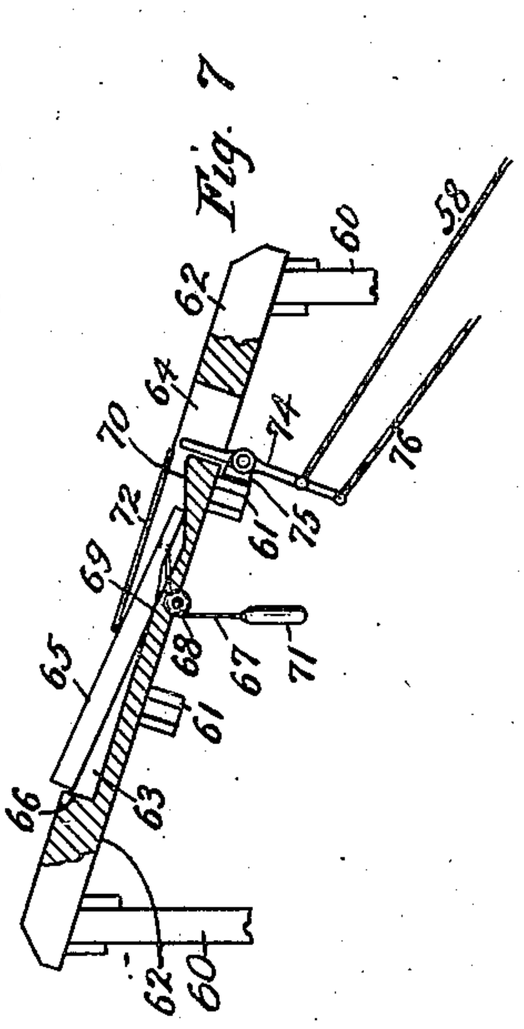

Fig. 7

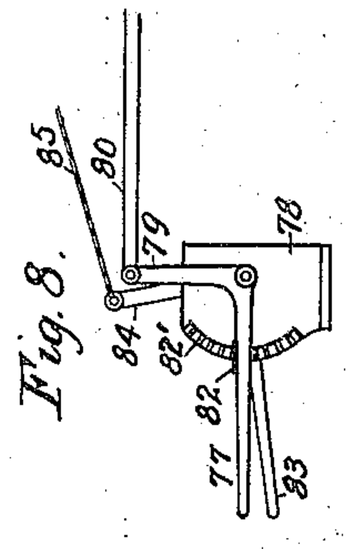

Fig. 8.

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Wm Bodge

Patented Jan. 2, 1923. 1,440,587

UNITED STATES PATENT OFFICE.

CHRISTIAN G. FEUCHT, OF BROOKLYN, NEW YORK.

SAFETY DEVICE FOR ROLLER COASTERS.

Application filed May 26, 1922. Serial No. 563,905.

To all whom it may concern:

Be it known that I, CHRISTIAN G. FEUCHT, a citizen of the United States, and resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Safety Devices for Roller Coasters, of which the following is a specification.

The invention relates to safety devices for roller coasters in which a series of cars or trains are arranged to be elevated by power up a main inclined section of an endless track from which point they are adapted to run by gravity over track sections comprising a plurality of down grades, dips and risers.

The general object of the present invention is to provide means by which the movement of the cars or trains running by gravity under separated headway may be automatically controlled or intercepted to avoid collisions.

More particularly the invention has for an object the provision of means whereby the accidental backward movement of a car or train on one section of the track will cause the interception of movement of a train on a preceding track section, and will shut off the power and temporarily prevent further advancement of succeeding trains.

The invention also includes certain details of construction and arrangement of parts hereinafter set forth.

For further comprehension of the invention, and of the objects and advantages thereof, reference is had to the following description and accompanying drawings, and to the appended claims in which the various features of the invention are more particularly pointed out.

Figure 1 of the drawings is a diagrammatic plan view showing an endless track in relation to parts of the operating mechanism.

Figure 2 is a side elevation, diagrammatically showing the lower and upper levels of the track, and the main inclined track section provided with the power elevating means.

Figures 3 and 4 are respectively detail plan and side views of the friction device.

Figure 5 is a detail elevation of a weight operating means for actuating the friction device.

Figures 6 and 7 are respectively detail plan and side views of the safety device for operating the friction device and the power cut-off device.

Figure 8 is a detail view showing a hand lever arranged to operate the friction device.

As indicated by the drawings the track is arranged in the general form of a loop in a plurality of sections, beginning its lowermost level at the power receiving point 10, and extending upwardly to form a main incline or riser 11 to an extreme upper level 12, from which point the track extends in a downward grade to form substantially a horizontally extending curved section 13, continuing in a dip or downward incline 14, where it merges into a curved section 15, thence into a riser 16 to the point 17, where it begins a second downward slope to form a curved track section 18; from which latter point the track continues its general downward descent by a series of well known dips and rises, not shown, to its lowermost curved level indicated at 19, the latter level serving as a receiving and sending section for the cars and an operating station for controlling the movements thereof by the friction devices disposed along the track.

For elevating the cars up the incline 11, an endless chain 20 is provided and arranged to run over a series of idlers 21, 22, 23, 24, and driven by the chain wheel 25 which in turn is driven by the pulley 26, belt 27 from the pulley 28 on the electric motor 29, the operating current for the latter being controlled from the switch handle 30 arranged to be opened, as indicated in dotted lines, by the lever 31 conveniently mounted adjacent the motor on the upright 32.

The upper curve track sections 13 are suitably supported on the structure indicated at 33, which also carries the friction plates 34, conveniently spaced with respect to the track and adapted to be engaged by correspondingly spaced shoes 73 arranged on the bottom surface of the cars. The friction plates are supported through blocking 35 upon the track structure in a yielding manner by bolts 36, passing through the structure, and provided with springs 37 and so arranged as to exert a downward thrust upon the plates. For operating the friction plates a series of cam levers 38 are provided and pivoted to the track structure at 39, the upper or plate engaging ends thereof being cam shaped or eccentrically

arranged with respect to their pivot points, while the lower ends of the levers are pivotally connected together in pairs by the connection rods 40; and for operating each of the said pairs of connected cam levers 38, a bell-crank lever 41 is provided, the latter being pivotally mounted by a vertical pin 42, fixed in the bracket 43, conveniently carried by the track structure. A connecting rod 44 connects one end of the bell-crank lever to the jointly connected pair of cam levers, while the opposite arms of the bell-crank levers are jointly connected together by the rods 45, as shown in Fig. 1. At one end of the series of bell-crank levers the direction of operating movement is changed from a substantially horizontal path to a vertical one by means of a connection rod 46 engaging a bell-crank lever 47, the latter being pivotally mounted on a horizontal axis and adapted by its movement in opposite directions to jointly operate the series of cam levers 38 in a similar manner.

For operating the above friction device as an emergency brake, a weight 48 is employed and provided at its upper end with an eye rod 49, in which is connected a shackle link 50 arranged to engage the hook end 51 of a carrier rod 52, the latter being pivoted at 53 to a frame 54, conveniently supported by the track structure. Upon the frame is also pivotally mounted a detent arm 55 having a lug 56 disposed to engage and normally hold the carrier rod 52 in the upright position shown, and in which position the hook end 51 is adapted to support the weight 48. To the rod 49 is also connected the lower end of a flexible cable 57, the upper end thereof being connected to the outer end of the bell-crank lever 47 in such manner as to afford a slack condition of the cable while the weight is supported by the hook 51. To the free end of the detent arm 55 is secured an operating line 58 which passes over an idler wheel 59 and is adapted to raise the outer end of the detent arm and thereby release the carrier rod 52, allowing the latter to turn about its pivotal point 53 and drop the weight 48, the force of which acting through the cable 57 and lever 47 serves to raise the yielding friction plates 34 a sufficient amount to afford a full frictional or braking engagement upon the shoes of the moving cars and bring the latter to a complete stop.

Fixed upon the supporting members 60 and 61 of the inclined riser section 16, is a safety device adapted to operate through the line 58 to release the weight and set the emergency brake. As shown in the detail plan view, Fig. 6, and in the partial sectional elevation, Fig. 7, the safety device comprises a block or case 62 having an elongated recess 63 and a slot 64 extending through said case, the recess being shaped to loosely receive an elongated tongue 65 of variable width. In its normal position as shown, the forward or upper end of the tongue is raised above the upper surface of the case where it engages as a stop the forward end wall 66 of the recess, which engagement is normally maintained by the flexible line 67 passing over the sheave wheel 68 rotatably mounted in the block. At its lower or rearward end the tongue is formed for a distance in a relatively narrow width which gradually increases to form a shoulder or bend 69 about which the tongue is adapted to rock as a pivotal point, the lower or narrow end of the tongue engaging the upwardly inclined bottom wall 70 of the recess. At its upper end the line 67 is fixed to the narrow lower end of the tongue and at its lower end the line is provided with a weight 71 adapted to exert a force tending to hold the lower or narrow end of the tongue against the inclined wall 70 and the upper end of the tongue against the stop wall 66 and above the upper surface of the case, the latter being provided with a cover plate 72 arranged to cover a section of the recess and to limit the upward movement of the tongue. During the ordinary running movement of the cars over the track, one of the car-shoes 73 engages the upwardly projecting tongue member 65 and downwardly forces the same about its pivotal point 69 and into the recess, the other parts of the safety device remaining inoperative.

In the normal movement of the cars over the dip section 14 of the track, the velocity obtained thereby is sufficient to carry the cars well over the relatively shorter and flatter riser section 16 and along the descending grade 18; but in the event of an unforeseen obstruction or disarrangement of any of the parts thereof tending to cause additional friction resistance to the running movement of the cars, resulting in the arrest of their forward movement before reaching the top of the riser section and a backward movement thereof, then the rear end of the car-shoe 73 will in their backward movement engage the upper projecting end of the tongue 65. In this latter engagement the tongue will be forced to slide lengthwise along the recess 63 and below the cover plate 72 and against the resistance of the connected weight 71, the lower or narrow end of the tongue being upwardly forced over the inclined bottom wall 70 and into engagement with the upper end of the lever 74 pivotally mounted in the bracket 75, fixed to the adjacent track-support 61. In its engagement by the tongue, the upper end of the lever 74 is adapted to move in the slot 64, while its opposite or lower end is connected to the line 58 and serves to

operate the detent arm 55 for the above-described purpose. Also the lower end of the lever 74 is furthermore connected by the line 76 to the switch-operating lever 31 and serves thereby in its safety operating movement to cut off the motive power of the driving chain 20 and thus prevent the further advancement of the cars along the track.

While the movement of the cars over the track may be intercepted by the above-described emergency brake, operating from the weight 48 to the friction plates 34 engaging the cars, the friction plates may also be adjusted independently of said emergency braking action by the hand lever 77, located at the operating station adjacent the level of the track section 19 and pivotally mounted on a standard 78. This hand lever is formed with an arm 79, the outer end of which is pivotally arranged with inflexible connection rod 80 leading through a conveniently arranged bell-crank lever 81 to the correspondingly shaped lever 47 connected to the friction device. Upon the arm 77 is fixed a wear-plate 82 adapted to engage the graduated teeth formed in the plate 82′ fixed to the standard 78, and by the adjustment of the hand lever with respect to the toothed plate corresponding adjustments may be made through the connection rods to raise and lower the friction plates relatively to the cars to effect on the latter a variable degree of frictional resistance, and thereby control their rate of movement along the track. Also pivotally carried by the standard 78 is a second hand lever 83 having an arm 84 connected to the line 85, leading to an idler or sheave wheel corresponding to and laterally positioned with respect to the idler wheel 59, and from which point the line is led and made fast to the end of the detent arm 55. As thus connected the hand lever 84 may at any time be operated to release the weight 48 and set the emergency brake independently of the automatic action of the line 58.

In the general running operation of the cars around the track with respect to the several safety devices, a loaded train comprising a plurality of cars is manually advanced at the operating or receiving station along the down grade lower level of the track section 19 to the power receiving point 10, from which position the train is conveyed by the drive chain 20 up the main inclined track section 11 to the high level sections 12 and 13, which form a gradually descending curve around which the cars run by gravity, continuing along over the dip and riser sections 14, 15, and 16, and then in the usual manner along a series of dips and rises (not shown) back to the receiving station.

The movement around the high level sections 12 and 13 is regulated by the adjustable hand lever at the receiving station in a manner to raise or lower the friction plates on their track sections for the engagement of the cars, the engagement being adjusted to suit the varying weather conditions and the required gravity speed to make the dip and riser sections 14, 15, and 16 and continue the movement of the cars along the track. In case of interception, or failure of the cars to fully make the rise 16, the train will begin a backward down grade movement, and engagement will be made between the rear end of one of the cars of the train and the tongue 65 of the suitably positioned safety device that will release the weight 48, causing the friction plates to be sufficiently raised to serve as an emergency brake to intercept the forward movement of the next following train. As the emergency brake is applied the safety device also operates to shut off the power from the drive chain 20 and prevent further advancement of the cars up the main inclined track section 11. The interception or accidental stoppage of a train during its gravity movement up the riser section 16 may be due to various causes, as displacement of track or car parts, or of carelessness or foolery on the part of the passengers.

For the further operative control of the cars, the track may be provided at desired points along its length with additional frictional devices similarly constructed and connected by suitably positioned bell-crank levers and inflexible connection rods to hand levers conveniently located at the operating station.

With the track as thus provided with the above-described control and safety devices, it will be evident that the cars may be operated thereon with a greater degree of safety, and in the event of the necessary operation of the emergency devices, and consequent interruption of the service, that the detached parts may be speedily replaced into the normal working position with little or no loss of time.

While I have illustrated and described the preferred construction and arrangement of the several devices and the manner in which they co-operate to accomplish the desired results, it is to be understood that various detail changes may be made in the several parts without departing from the essential principle and scope of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A roller coaster comprising a track adapted for the movement of a car, a friction device arranged on a section of said track, a safety device arranged on a section of said track in advance of the section carrying said friction device, said safety device being operatively connected to said friction device. and means actuated by the backward movement of a car to engage said safety de-

vice for the operation of said friction device.

2. A roller coaster comprising a track adapted for the movement of a car, a friction device arranged on a section of said track, a safety device arranged on a section of said track in advance of the section carrying said friction device, said safety device being operatively connected to said friction device, means on said safety device held inoperative during the forward movement of a car, and means actuated by the backward movement of a car to engage said safety device for the operation of said friction device.

3. A roller coaster comprising a track adapted for the movement of a car, a friction device arranged on a section of said track, a weight adapted when released to operate said friction device, a safety device arranged on a section of said track in advance of the section carrying said friction device, said safety device being operatively connected to release said weight, and means actuated by the backward movement of the car to engage said safety device for the release of said weight.

4. A roller coaster comprising a track adapted for the movement of a car, a friction device arranged on a section of said track, a weight adapted when released to operate said friction device, a safety device arranged on a section of said track in advance of the section carrying said friction device, said safety device being operatively connected to release said weight, means on said safety device held inoperative during the forward movement of a car, and means actuated by the backward movement of a car to engage said safety device for the release of said weight.

5. A roller coaster comprising a track adapted for the movement of cars, a source of power arranged to operate said cars over a section of said track, a safety device arranged on a section of said track in advance of the section provided with said source of power, said safety device being operatively connected to means for cutting off said source of power, and means actuated by the backward movement of a car to engage said safety device and cut off said source of power.

6. A roller coaster comprising a track adapted for the movement of cars, a source of power arranged to operate said cars over a section of said track, a safety device arranged on a section of said track in advance of the section provided with said source of power, said safety device being operatively connected to means for cutting off said source of power, means on said safety device held inoperative during the forward movement of a car thereover, and means actuated by the backward movement of a car to engage said safety device and cut off said source of power.

7. A roller coaster comprising a track adapted for the movement of cars, a source of power arranged to operate said cars over a section of said track, a friction device arranged on a section of said track in advance of the section provided with said source of power, a safety device arranged on a section of said track in advance of the section carrying said friction device, said safety device being jointly connected to means for cutting of said source of power and for operating said friction device, and means actuated by the backward movement of a car to engage said safety device for jointly cutting off said source of power and operating said friction device.

8. A roller coaster comprising a track adapted for the movement of cars, a source of power arranged to operate said cars over a section of said track, a friction device arranged on a section of said track in advance of the section provided with said source of power, a safety device arranged on a section of said track in advance of the section carrying said friction device, said safety device being jointly connected to means for cutting off said source of power and for operating said friction device, means on said safety device held inoperative during the forward movement of a car thereover, and means actuated by the backward movement of a car to engage said safety device for jointly cutting off said source of power and operating said friction device.

9. A roller coaster comprising a track adapted for the movement of a car, a friction device arranged on a rearward section of said track, a weight adapted when released to operate said friction device, and means operated by the movement of a car over a forward section of said track for releasing said weight.

10. A roller coaster comprising a track adapted for the movement of a car, a friction device arranged on a rearward section of said track, a weight suspended adjacent said friction device in slack connection therewith, and means operated by the movement of a car over a forward section of said track for releasing said weight for the operation of said friction device.

11. In a roller coaster, a friction device arranged to control the movement of the cars over a rearward section of the track, a weight connected to and adapted to operate said friction device, and means operated by the movement of a car over a forward section of the track for controlling the operation of said weight.

12. A friction device comprising friction plates adapted to engage a car in its movement over a rearward section of the track, a weight connected to said plates and adapt-

ed to exert a force thereon to intercept the movement of the car, supporting means for said weight arranged independently of said plates, and means for releasing said independently supporting means by the movement of a car over a forward section of the track.

13. A friction device comprising friction plates adapted to engage a car in its movement over a rearward section of the track, a weight connected to said plates adapted to exert a force thereon to intercept the movement of the car, supporting means for said weight arranged independently of said plates and comprising a pivotally mounted carrier rod supported against movement by a detent arm, and means actuated by the movement of a car over a forward section of the track for operating said detent arm for the weight-releasing movement of said carrier rod.

14. A roller coaster comprising a track adapted for the movement of cars, an operating station therefor, a friction device arranged on a rearward section of the track, said friction device comprising friction plates adapted to engage a car on said rearward track section, a weight connected to said plates and adapted to exert a force thereon to intercept the movement of the car, supporting means for said weight arranged independently of said plates, means for tripping said weight-supporting means by the movement of a car over a forward section of the track, and a hand lever mounted on said operating station and operatively connected to release said weight-tripping means.

15. A roller coaster comprising a track adapted for the movement of cars, friction devices arranged adjacent a rearward section of the track and comprising friction plates adapted to engage and control the movement of the cars thereon, means for yieldingly supporting said friction plates free of said cars, cam-levers arranged to urge said plates into engagement with said cars in opposition to said yielding means, means for jointly connecting said cam-levers together, means for operating said jointly connected levers, and means actuated by the movement of a car over a forward section of the track for controlling the lever-operating means.

16. A roller coaster comprising a track adapted for the movement of cars, friction devices arranged adjacent a rearward section of the track and comprising friction plates adapted to engage and control the movement of the cars thereon, means for yieldingly supporting said friction plates free of said cars, cam-levers arranged to urge said plates into engagement with said cars in opposition to said yielding means, means for jointly connecting said cam-levers together, means for controlling the operation of said jointly connected cam-levers by the movement of a car over a forward section of the track, and a hand-lever mounted on said operating station and operatively connected to said jointly connected cam-levers.

17. The combination of a track, a friction-plate, yielding means normally urging said plate into position with respect to said track, a plurality of cam-levers arranged to raise and lower said friction plate in cooperation with said yielding means, joint means for operatively connecting said cam-levers together, means for operating said cam-levers controlled by the movement of a car over a section of the track forward of said friction plate, and a hand lever connected to said cam-levers and arranged to adjust the position of said friction-plate.

18. The combination of a track, a friction-plate disposed adjacent to said track, a plurality of jointly connected cam-levers arranged to operate said friction-plate, a weight having a flexible connection to said cam-levers and normally held inoperative with respect thereto, and means operated by the movement of a car over a section of the track forward of said friction-plate for releasing said weight.

19. A roller coaster comprising a plurality of track sections adapted for the gravity operation of the cars, a friction device arranged on a rearward track section to control the running movement of said cars, and a safety device arranged on a forward track section and operatively connected to said friction device whereby an interception of the running movement of a car over the forward section of the track will cause the interception of a following car on the rearward track section.

20. A roller coaster comprising an upwardly inclined track, power operated means for advancing the cars up said inclined track, a plurality of track sections adapted for the gravity operation of the cars, a friction device arranged on a rearward gravity track section to control the running movement of said cars, and a safety device arranged on a forward gravity track section and operatively connected to said friction device whereby an interception of the running movement of a car over the forward track section will cut off said power advancing-means.

21. A roller coaster comprising a plurality of track sections adapted for the gravity operation of the cars, a friction device arranged on a rearward track section to control the running movement of said cars, hand operated means adjustably connected to variably hold the tension of said friction devices to control the speed of said cars, and a safety device arranged on a forward track section and connected to said friction device

whereby an interception of the running movement of a car over the forward section of the track will cause the interception of a following car on the rearward track section.

22. In a roller coaster having track sections over which the cars are adapted to advance by gravity, a safety device arranged on a forward section of the track and including a movable tongue held inoperative during the forward movement of the cars, means adapted to be operated by said tongue to arrest the advance of the cars over a rearward section of the track, and means adapted by the backward movement of the cars over said safety device to operate said tongue.

23. In a roller coaster having track sections over which the cars are adapted to be advanced by gravity and by power, a safety device arranged on a forward section of the track and including a tongue held inoperative during the forward advancement of the cars, means adapted to be operated by said tongue to jointly arrest the gravity and the power advancement of the cars over a rearward section of the track, and means adapted by the backward movement of the cars over said safety device to operate said tongue.

24. In a roller coaster having track sections over which the cars are adapted to be advanced, a safety device including a casing arranged on a forward section of the track, a tongue movable within said casing and held inoperative during the forward movement of the cars, a lever mounted for engagement by said tongue, means adapted to be operated through said tongue and lever to arrest the advancement of the cars over a rearward section of the track, and means adapted by the backward movement of the cars over said safety device to operate said tongue.

25. In a roller coaster, a track, a friction device adapted to intercept the advance of the cars on a section of said track, a safety device disposed on a section of said track forward of said friction device and operatively connected to the latter, means adapted by the backward movement of a car over said safety device to operate said friction device, and a hand-lever operatively connected to and adapted to operate said friction device independently of said safety device.

26. In a roller coaster, a track, a source of power including a chain carrier adapted to elevate the cars over a section of said track, a friction device arranged on a section of said track forward of said power device and adapted to intercept the movement of the cars thereon, a safety device disposed on a section of said track forward of said friction device and operatively connected to said source of power and friction device, and means adapted by the movement of a car over said safety device to jointly operate said source of power and friction device.

27. In a roller coaster, a track, a source of power including a carrier chain adapted to elevate the cars over a section of said track, a friction device arranged on a section of said track forward of said power device and adapted to intercept the movement of the cars thereon, a safety device disposed on a section of said track forward of said friction device and operatively connected to said source of power and friction device, means adapted by the movement of a car over said safety device to jointly operate said source of power and friction device, and hand-levers operatively connected to and adapted to operate said friction and power devices independently of said safety device.

Signed at Brooklyn, in the county of Kings and State of New York, this 20th day of May, A. D. 1922.

CHRISTIAN G. FEUCHT.